

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

REC'D 29 DEC 2004

WIPO

Applicant's or agent's file reference P100771WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/GB 03/03727	International filing date (day/month/year) 29.08.2003	Priority date (day/month/year) 28.09.2002
International Patent Classification (IPC) or both national classification and IPC B23K26/40		
Applicant BNFL (IP) LIMITED		



1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 16.04.2004	Date of completion of this report 29.12.2004
Name and mailing address of the International preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Aran, D Telephone No. +31 70 340-2331 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB 03/03727

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*):

Description, Pages

1-15 as originally filed

Claims, Numbers

1-13, 28 as originally filed

14-27 received on 07.09.2004 with letter of 03.09.2004

Drawings, Sheets

1/5-5/5 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/GB 03/03727**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-27
	No: Claims	
Inventive step (IS)	Yes: Claims	1-27
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-27
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB 03/03727

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

PATENT ABSTRACTS OF JAPAN vol. 012, no. 424 (M-761), 10 November 1988 (1988-11-10) & JP 63 157778 A (TAISEI CORP), 30 June 1988 (1988-06-30)

The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document): a method (claim 1) resp. an apparatus for the cutting of thick sections of cement-based materials using a laser beam producing molten material; breaking solidified material into particles (12); and, removing said particles by suction means (13).

The subject-matter of claim 1 resp. 22 differs from this known method resp. apparatus in that laser beam is produced at a power density such as to produce a depth of molten material of a maximum of 10mm (claim 1) resp. laser beam is unfocussed (claim 22). In both cases laser beam is produced with a lower power density so as to produce a lower depth of molten material than in D1.

The subject-matter of claim 1 resp. 22 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as "producing deeper cuts".

The solution to this problem proposed in claim 1 resp. 22 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons: "though the kerf width initially tapers quite rapidly, it appears to reach a width where deeper cutting width remains constant, allowing thus deeper cuts"

Claims 2-21 resp. 23-27 are dependent on claim 1 resp. 22 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

14. A method according to any one preceding claim wherein an oxygen jet is applied directly at the beam spot when reinforcing steel bars are being cut.
15. A method according to any one preceding claim wherein the surface temperature of the material being treated lies in the range 700°C to 2400°C.
- 5 16. A method wherein the vapour-to-melt ratio lies in the range between 0.05 and 3.
17. A method according to any one preceding claim wherein the material removal rate lies in the region of $150 \text{ cm}^{-3} \cdot \text{kWh}^{-1}$ for a diode laser and $100 \text{ cm}^{-3} \cdot \text{kWh}^{-1}$ for a CO_2 laser.
18. A method according to any one preceding claim wherein the laser is selected from a CO_2 or diode laser.
- 10 19. A method according to any one preceding claim from 1 to 17 wherein the laser is selected from one of: Nd:YAG, diode, Fibre or COIL type lasers.
20. A method according to claim 19 wherein the laser beam is delivered by a fibre optic cable.
- 15 21. A method according to any one preceding claim wherein the laser beam is delivered by a mobile beam delivery system comprising a system of reflecting mirrors.
22. Apparatus for the cutting of thick sections of cement-based materials comprises: means for mutually traversing a surface to be cut with a laser beam at a power density so as to produce a depth of molten material of a maximum of 10mm at each traverse; means for breaking melted and re-solidified material into particles; and, means for removing said particles by suction means.
- 20 23. Apparatus according to claim 22 wherein the means for breaking re-solidified material comprises a percussive member for crushing the material.
- 25 24. Apparatus according to claim 23 wherein the percussive member is hollow and crushed material is removed through the member by suction means.
25. Apparatus according to any one of preceding claims 22 to 24 wherein the laser beam is defocused.
26. Apparatus according to any one of preceding claims 22 to 25 wherein the laser beam is substantially parallel.
- 30

27. Apparatus according to any one of preceding claims 22 to 26 wherein the laser beam has a circular cross section.
28. Apparatus according to any one of preceding claims 22 to 26 wherein the laser beam is rectangular in cross section.